

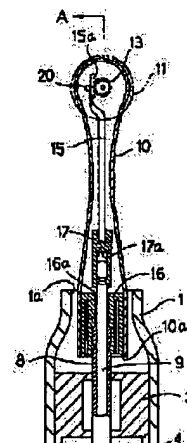


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 Title of invention: MOTOR-DRIVEN TOOTHBRUSH
 Abstract: PURPOSE: To provide a motor-driven toothbrush capable of rotating a rotary brush body surely without disengagement between a rack and a pinion. CONSTITUTION: A rotary brush 11 is arranged to rotate freely at the tip of an attachment 10 connected to a drive shaft 8. An extension bar 15 relatively movable with respect to the attachment 10 while it is put inside the attachment 10 and connected to a fixed shaft 9 in a case 1 when the attachment 10 is connected to the drive shaft 8. A pinion 13 is arranged at the rotary shaft of a rotary brush body 11 while a rack 15a is formed. At the rear side restriction means 20 for preventing the rack 15a from being displaced to the opposite side to the pinion 13. COPYRIGHT: (C)1995, JPO



TRANSLATION FROM JAPANESE

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(72) Inventor: AMAKASU MIKIO

(56) Cited References: Kokai 6-121701 (JP, A)

(54) [Title of the Invention] **Electrically powered toothbrush**

(57) [Claims]

[Claim 1] An electrically powered toothbrush comprising:

a drive motor housed within a case;

a drive shaft supported within said case and displaceable in the axial direction;
a first motion conversion mechanism for converting rotation of said drive motor into reciprocating motion and transmitting same to said drive shaft;
an attachment coupled with said drive shaft;
a rotating brush head rotatably attached to the distal end of said attachment;
an extension bar housed within said attachment, and that when said attachment is coupled with said drive shaft, couples with a fixed shaft fixed located within said case, so as to be capable of relative motion with respect to said attachment,
a rack provided to said extension bar;
and a pinion for meshing with said rack, provided on the rotating shaft of said brush head; and
restricting means provided on the back side of said rack, for preventing said rack from shifting to the opposite side from said pinion.

[Claim 2] The electrically powered toothbrush according to claim 1 wherein said restricting means is a rolling bearing.

[Claim 3] The electrically powered toothbrush according to claim 2 wherein ribs for engaging the extension bar are provided at the front and back ends of said rolling bearing.

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JP 2719556

CLAIMS

(57) [Claim(s)]

[Claim 1] The drive motor formed in the interior of a case, and the driving shaft currently supported free [migration to shaft orientations] inside the above-mentioned case, The 1st movement translator which changes rotation of the above-mentioned drive motor into a reciprocating motion, and is transmitted to the above-mentioned driving shaft, The attachment connected with the above-mentioned driving shaft, and the rotation brush object prepared in the point of the above-mentioned attachment free [rotation]; The rack relatively prepared in the movable extension bar and the above-mentioned extension bar to the attachment concerned while connecting with the fixed shaft prepared in the interior of the above-mentioned case fixed, when it has prepared in the interior of the above-mentioned attachment and the attachment concerned is connected with the above-mentioned driving shaft, The electric toothbrush which possesses the pinion prepared in the revolving shaft of the above-mentioned rotation brush object, and is characterized by having established the regulation means for preventing that the rack concerned displaces to the above-mentioned pinion and the opposite side to the tooth-back side of the above-mentioned rack while gearing with the above-mentioned rack.

[Claim 2] The above-mentioned regulation means is an electric toothbrush according to claim 1 characterized by being anti-friction bearing.

[Claim 3] The electric toothbrush according to claim 2 characterized by having prepared the rib with which the above-mentioned extension bar fits in, respectively in the front end and the back end of the above-mentioned anti-friction bearing.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to an electric toothbrush.

[0002]

[Description of the Prior Art] About the electric toothbrush, many things are proposed conventionally and a variety of electric toothbrushes are marketed till today. the thing it was made to drive to the longitudinal direction by the motor which has prepared the typical thing free [migration] and free [attachment and detachment] also in it relatively [the attachment which has a brush object in the upper limit section / case], and has been formed in the interior of a case -- or there is a thing it was made to drive the brush object itself instead of an attachment. For example, the electric toothbrush with which it was made for the hair ends of a brush to vibrate finely is indicated by JP,61-55963,B. Moreover, the electric toothbrush which makes the gear-tooth brush attached in the driving shaft reciprocate along the shaft orientations or the direction of an axial right angle is indicated by JP,61-64204,A.

[0003] The electric toothbrush which made adjustable the stroke of reciprocation of the shaft orientations given to a gear-tooth brush is indicated by JP,61-79410,A further again. In what gave a fine vibration to the gear-tooth brush among the above-mentioned Prior arts, when the body of a gear-tooth brush is grasped strongly, this fine vibration is absorbed, the vibration displacement of a brush object becomes close to zero, and a toothbrushing operation falls. Moreover, in what gave movement to the attachment section (part equivalent to the shank of the usual gear-tooth brush) which has a brush object, the brush object itself has fixed to the attachment and it is immobilization. Moreover, in the thing it was made for the brush object itself to rotate, the part of the attachment which has a brush object serves as immobilization. The electric toothbrush which was excellent in the toothbrushing effectiveness is proposed by giving rotation to the brush object itself prepared in this attachment at the same time it gives the reciprocating motion of shaft orientations to the attachment to which an applicant for this patent has a brush object in Japanese Patent Application No. No. 35301 [five to] in view of such the actual condition. This prior ***** was that in which a rotation brush object carries out both-way rotation on an attachment 10 by rolling the rack 15a top which has formed the pinion 13 prepared in the revolving shaft of the rotation brush object (not shown) established at the tip of an attachment 10 free [rotation] in the point of the extension bar 15 prepared fixed, as shown in drawing 1 .

[0004]

[Problem(s) to be Solved by the Invention] As shown in drawing 1 , when own die length (vertical lay length of drawing 1) of rack 15a is large, there is a possibility that rack 15a may displace to the side and the opposite side in which a pinion 13 is located (broken line of drawing 1). Thus, when rack 15a displaces, even if engagement with rack 15a and a pinion 13 separates, consequently an attachment 10 reciprocates in the vertical direction (shaft orientations), there is a possibility that the fault that a rotation brush object does not rotate on an attachment 10 may occur. Rack 15a prevents displacing to the opposite side (left of drawing 1) the side in which a pinion 13 is located, and maintains certainly engagement with rack 15a and a pinion 13, and the purpose of this invention has it in offering the electric toothbrush which can give rotation certainly to a rotation brush object.

[0005]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the electric toothbrush of this invention Rotation of the drive motor with which the driving shaft is supported free [migration to shaft orientations] inside the case, and is prepared in the interior of a case is changed into a reciprocating motion by the 1st movement translator, and is transmitted to a driving shaft. The rotation brush object is prepared in the point of the attachment connected with a driving shaft free [rotation]. When it has prepared in the interior of an attachment and the attachment concerned is connected with the above-mentioned driving shaft, while connecting with the fixed shaft prepared in the interior of the above-mentioned case fixed, the rack is relatively prepared in the movable extension bar to the attachment concerned. While gearing with this rack, it is characterized by having prepared the pinion prepared in the revolving shaft of a rotation brush object, and having formed the regulation means for preventing that the rack concerned displaces to a pinion and the opposite side in the tooth-back side of a rack. Preferably, anti-friction bearing is used as a regulation means. The rib with which an extension bar fits in is prepared in the front end and the back end of anti-friction bearing still more preferably, respectively.

[0006]

[Example] The 1st example of this invention is explained with reference to drawing 2 -5. As shown in drawing 2 and 3, DC motor 2 which makes a driving source the dry cell which is not illustrated is provided in the case 1 bell shape interior which has opening 1a in upper limit through the supporter material 3. The bevel gear 4 is formed in the supporter material 3 free [rotation] through the shaft 5. The tooth part of this bevel gear 4 has geared with the motor pinion 6 prepared in DC motor 2.

[0007] Eccentric-cam 4a is formed in the lateral portion of a bevel gear 4 at one, and the cam follower 7 is engaging with this eccentric-cam 4a. The cam follower 7 had opening 7a which has height equal to the diameter of eccentric-cam 4a as shown in drawing 1 , and eccentric-cam 4a has fitted in in this opening 7a. One direction rotation centering on the shaft 5 of a bevel gear 4 is changed into the reciprocating motion of the vertical direction by the cam follower 7 which follows rotation of eccentric-cam 4a. This eccentric-cam 4a and cam follower 7 constitute the 1st movement translator which changes rotation of DC motor 2 into a reciprocating motion. In the center of the upper part of the supporter material 3, the driving shaft 8 which makes the shape of hollow is supported free [sliding] in accordance with the shaft orientations (the vertical direction of drawing 2). The lower limit section of a driving shaft 8 has connected with arm section 7b of the cam follower 7 upper part, and the reciprocating motion of the vertical direction of a cam follower 7 is transmitted to this driving shaft 8. Inside the hollow of a driving shaft 8, the fixed shaft 9 has penetrated in same axle, the lower limit section of this fixed shaft 9 was crooked in the shape of L character, and is projected from notch 8a of a driving shaft 8, and that protrusion edge 9a has fixed to the wall of the supporter material 3. In addition, it is prevented that the water which invaded from upper limit opening 1a of a case 1 trespasses even upon the case 1 interior in which DC motor 2 and the bevel gear 4 grade are prepared by the supporter material 3. The point of a driving shaft 8 is equipped with the attachment 10 which has opening 10a free [attachment and detachment] through the connection adapter 16 mentioned later in the lower limit. Therefore, the both-way drive of this attachment 10 is relatively carried out in the vertical direction to a case 1 at a driving shaft 8 and one. The shaft 12 is formed in the interior of the tip of an attachment 10. The rotation brush object 11 which has two or more brushes is established free [rotation] and free [attachment and detachment] to the attachment 10 through this shaft 12. On the shaft 12 which is the center of rotation of the rotation brush object 11, the pinion 13 rotated to this rotation brush object 11 and one is supported to revolve. Two or more heights 10b is formed in the interior of an attachment 10. It is supported so that the extension bar 15 can slide freely in accordance with those shaft orientations (the vertical direction of drawing 1) by this heights 10b inside an attachment 10. The upper limit section of the extension bar 15 is crooked in the shape of L character, and rack 15a which gears with the tooth part of a pinion 13 to this flection is formed. In addition, weep hole 10c for draining the water which invaded from between an attachment 10 and the rotation brush objects 11 is formed in the peripheral face of an attachment 10. The connection adapter 16 which has through tube 16a in the center is fixed to the lower part of an attachment 10. As shown in drawing 4 , when the lower limit section of through tube 16a of this connection adapter 16 inserts an attachment 10 in upper limit opening 1a of a case 1, it connects with the upper limit section of a driving shaft 8. Therefore, the both-way drive of the attachment 10 is relatively carried out in the vertical direction to a case 1 at a driving shaft 8 and one. In addition, when a driving shaft 8 is equipped with

the connection adapter 16 in this way, the upper limit section of the fixed shaft 9 which penetrates a driving shaft 8 carries out the penetration protrusion of the through tube 16a of the connection adapter 16, and advances inside an attachment 10. In the lower limit section of the extension bar 15, the connection coupler 17 which has opening 17a in the lower limit is fixed. Opening 17a of this connection coupler 17 connects with the upper limit section of the fixed shaft 9, when a driving shaft 8 is equipped with the connection adapter 16 of an attachment 10. Therefore, although an attachment 10 exercises in the vertical direction to a case 1 united with a driving shaft 8, the extension bar 15 connected with the fixed shaft 9 is to a case 1 in the immovable state. For this reason, as shown in drawing 3, the pinion 13 which gears to rack 15a of the extension bar 15 upper-limit section carries out both-way rotation with vertical motion of an attachment 10 at the circumference of a shaft 12. Rotation of this pinion 13 is directly transmitted to the rotation brush object 11, and the rotation brush object 11 carries out both-way rotation on an attachment 10. Thus, a pinion 13 and rack 15a constitute the 2nd movement translator which changes the reciprocating motion of the vertical direction (shaft orientations) of an attachment 10 into rotation. As shown in drawing 2, and 4 and 5, inside the tip of an attachment 10, the anti-friction bearing 20 which is a regulation means for engaging with field 15b of the opposite side of rack 15a, and regulating the variation rate to the drawing 4 left of this rack 15a is supported to revolve free [rotation] on the fixed shaft 21. The configuration of anti-friction bearing 20 is making the shape of a pipe here, and the peripheral face is always engaging with field 15b of the opposite side of rack 15a. Actuation is explained below. The peripheral face of a case 1 is grasped, and if the switch which does not illustrate is turned ON, DC motor 2 will rotate. Rotation of DC motor 2 is changed into the reciprocating motion of the longitudinal direction of a case 1 through the motor pinion 6 and a bevel gear 4 by eccentric-cam 4a and the cam follower 7 which are the 1st movement translator, it is transmitted to a driving shaft 8, and this driving shaft 8 and the attachment 10 of one reciprocate in the vertical direction to a case 1. If an attachment 10 exercises in the vertical direction, the pinion 13 which gears to rack 15a of the extension bar 15 upper-limit section connected with the fixed shaft 9 fixed to the case 1 will carry out both-way rotation at the circumference of a shaft 12, and the rotation brush object 11 will carry out both-way rotation by the point of an attachment 10. As shown in drawing 4 and 5, here field 15b of the opposite side of rack 15a Since it is always engaging with the peripheral face of the anti-friction bearing 20 currently supported to revolve free [rotation], As shown in drawing 1 (the conventional configuration), even if own die length (vertical lay length of drawing 1) of rack 15a is large, it is regulated that rack 15a displaces to the opposite side the side in which a pinion 13 is located, and engagement with rack 15a and a pinion 13 does not separate. Next, it is drawing 6 about the 2nd example of this invention. It refers to and explains. Here, the same sign is substantially given to the same thing with the 1st above-mentioned example, and the explanation is omitted. The ribs 30a and 30b which engage with field 15b of the opposite side of rack 15a at the front end and the back end of anti-friction bearing 30 are formed in one, respectively. Therefore, field 15b of the opposite side of rack 15a will be located in the crevice formed among the ribs 30a and 30b of anti-friction bearing 30, and it can also prevent it collectively that rack 15a sways to a cross direction (the vertical direction of drawing 6) while it is regulated that rack 15a displaces to the opposite side the side in which a pinion 13 is located.

[0008]

[Effect of the Invention] Since the regulation means for preventing that the rack concerned displaces to a pinion and the opposite side is formed in the tooth-back side of a rack according to the electric toothbrush of this invention as explained above, It is regulated that a rack displaces to the opposite side the side in which a pinion is located even if the own die length of a rack is large. The electric toothbrush which was excellent in the toothbrushing effectiveness that engagement with a rack and a pinion cannot break away and rotation can be certainly given to a rotation brush object can be cheaply offered with an easy configuration (effectiveness of claim 1). Moreover, if the above-mentioned readjustment means is used as anti-friction bearing, sliding with a regulation means can be made smooth the tooth-back side of a rack (effectiveness of claim 2). If a rib is prepared in the above-mentioned front end and the above-mentioned back end of anti-friction bearing further again, respectively, while it is controllable that a rack displaces to the opposite side the side in which a pinion is located, it can also combine that a rack sways to a cross direction (center-of-rotation shaft orientations of a pinion), and it can be prevented (effectiveness of claim 3).

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the expanded sectional view of an important section showing a configuration conventionally.

[Drawing 2] It is the cross-section front view showing the 1st example.

[Drawing 3] It is the A-A line sectional view of drawing 2.

[Drawing 4] It is the expanded sectional view of an important section.

[Drawing 5] It is the B-B line sectional view of drawing 4.

[Drawing 6] It is the expanded sectional view of an important section showing the 2nd example.

[Description of Notations]

1 Case

2 Drive Motor

4a, 7 1st movement translator

8 Driving Shaft

9 Fixed Shaft

10 Attachment

11 Rotation Brush Object

13 15a 2nd movement translator

15 Extension Bar

20 30 Regulation means (anti-friction bearing)

30a, 30b Rib

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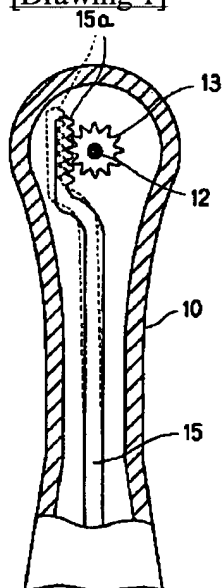
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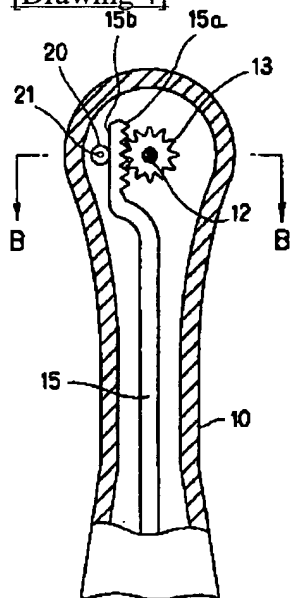
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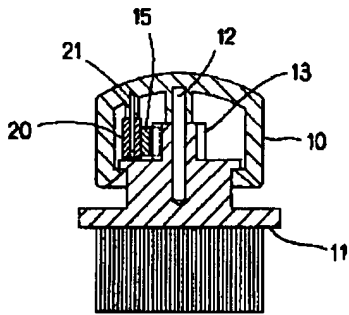
[Drawing 1]



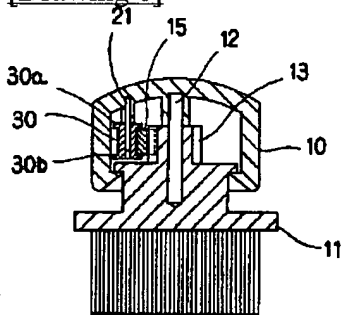
[Drawing 4]



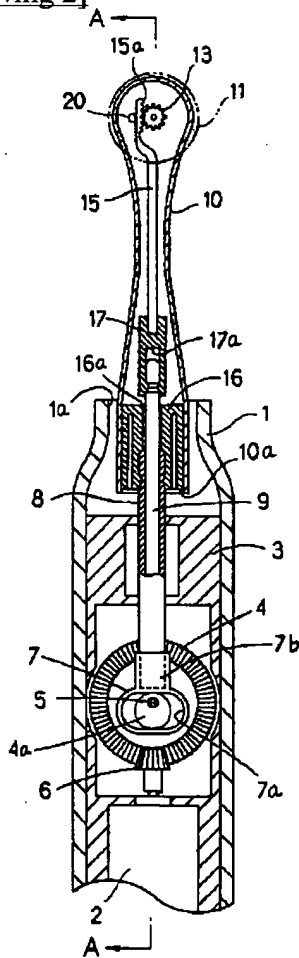
[Drawing 5]



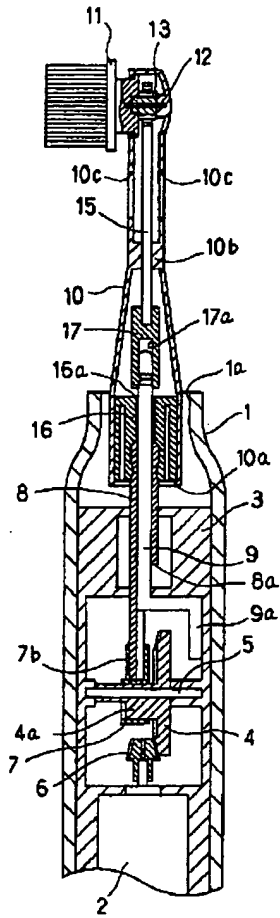
[Drawing 6]



[Drawing 2]



[Drawing 3]



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